Teaching Case Study

Design for Material Change

A Light Fixture for the Future

Proposal Sheet

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CONTENT

ABBREVIATIONS

B2B	Business to business
B2C	Business to consumer
CE	Circular Economy
CO2e	Carbon dioxide equivalent
LCA	Life Cycle Assessment
R&D	Research and development
SCABEE	Sustainability teaching CAse studies for Business & Engineering Education
TCS	Teaching Case Study

1 GENERAL INFORMATION

Activity Sector	Product development, construction and design, selection of materials		
Keywords	Life Cycle Assessment (LCA); Circular Economy (CE); R-strategies,		
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Public	Initial and alternative education ☒ Beginners ☒ Intermediaries ☐ Experts	Continuing education ☒ Beginners ☒ Intermediaries ☐ Experts	
Domain(s)	☒ CSR ☐ Economics ☐ Entrepreneurship ☐ Finance ☐ HRM ☐ Information Systems ☐ Law ☐ Marketing ☐ Political Sciences ☐ Strategy ☐ Supply chain & logistics	☐ Arts, Architecture, Design, Ergonomics ☐ Education Sciences ☐ Geography & Urban Planning ☐ Information & Communication Sciences ☐ Literature & Language Sciences ☐ Medical Sciences ☐ Physical Activities & Sport Sciences ☐ Psychology, Sociology, Philosophy, Demography	☐ Biology & Neurosciences ☐ Chemistry, Biochemistry ☐ Earth & Universe Sciences ☐ Electrical, Electronics ☐ Energetics ☐ Mathematics & Computer Science ☒ Mechanical Engineering ☐ Physics ☒ Processes
UN SDG	☒ 9 Industry, Innovation, and infrastructure ☒ 13 Climate Action ☒ 12 Responsible consumption and production		
Place in the Circular Economy Model	☒ Raw materials ☒ Sustainable design ☐ Production ☐ Distribution ☐ Consumption Reuse Repair ☐ Collection ☐ Waste management ☐ Residual waste		

2 ABSTRACT

OneLight, a Danish company based in Aalborg, develops and sells light fixtures to both consumers (B2C) and professionals (B2B).

Inspired by a recent event on environmental sustainability, the company's Chief Executive Officer (CEO) has established a new R&D Project Team to focus on integrating sustainability into the product development process.

The students are part of this newly formed R&D Project Team. A specific product has been chosen as a pilot for the students. The task is structured into four key steps:

1. Environmental Impact Analysis: Analyse the environmental impact of an existing light fixture, focusing on CO2e emissions. Propose ways to reduce the product's environmental impact by improving materials, construction, and manufacturing processes for one or more components.
2. Circularity Analysis: Evaluate the circularity level of the same product and suggest strategies to enhance the circularity, including aspects such as material recycling, reuse, and repair.
3. Product Redesign: Propose a redesign of the light fixture that improves its environmental impact and circularity while maintaining its functionality and market suitability.
4. Process Development: Summarize the insights and experiences gained into a generic framework for addressing environmental sustainability in One Light's product development process.

This project will serve as a foundation for embedding sustainability into One Light's product strategy, providing a roadmap for future developments.

3 PEDAGOGIC GOALS & PREREQUISITES

Considering the product perspective, the overall learning objectives within environmental sustainability for the case are as follows.

The students will be able to:

- Understand how changes in materials, construction, and manufacturing processes can affect a product's environmental impact.
- Understand how changes in materials, construction, and manufacturing processes can affect a product's circularity.
- Conduct a Life Cycle Assessment (LCA) to analyse a product's environmental impact.
- Analyse a product's circularity.

Moreover, the case supports a broader range of learning opportunities across fields such as product development, manufacturing, supply chain logistics, and business processes. However, these learning potentials and objectives embedded in the case are not formally described here. Hence, it is up to educators to take advantage of these opportunities.

4 SUSTAINABILITY GOALS

This TCS focuses on two key aspects of environmental sustainability: *environmental impact* and *circularity*, emphasising how these factors are influenced by design and construction choices made during the product development phase.

For environmental impact, the focus is on conducting a (simplified) life cycle assessment (LCA) specifically measuring CO2e emissions.

For circularity, the emphasis is on implementing R-strategies, drawing from the principles of the Circular Economy (CE) concept.

5 CASE DESCRIPTION

Year of the problematic	2024
Duration for students	Preparation: 2 hours Implementation: 6 days
Languages	☒English ☐ Other: ……
Use case	☐ In class ☒ Examination TCS
Category	☐ C1: Case written in collaboration with a company that has given its consent to use its internal sources such as the company name, figures, photos, videos, and so on. Join the agreement sheet. ☐ C2: Case based on real company information and with the acceptance of the company to use its data, but names or figures (of company and persons) are modified to keep them confidential. Join the agreement sheet. ☐ C3: Case written using external public sources (annual report, websites, brochures, newspapers, …) where names or verbatims of the protagonists are used. Join the agreement sheet. ☐ C4: Case based on real a company using public information without the agreement of the company (generally, the names (company and persons) are changed to anonymous ones. Impossibility to make the link between the TCS and the company. ☒ C5: Imaginary case based on teacher's experience who collected information from several companies in order to write a case study with a fictive integrative company. It can also be a compilation of different situations of several periods put together at the same time to form a pedagogic tool.
Number of pages: Case scenario / Annex	8 / 30
Number of pages: Teachers' note:	15
Diffusion licence	See cover page

6 Case Pack Components

6.1 General Documentation

Table 6.1: General TCS documents

Document name	Description	File name	# pages
Proposal Sheet	Teaching Case Study Description. This file can be published to inform potentially interested persons about the Teaching Case Study (this file)	SCABEE TCS Design for Material Change (2024) – Proposal Sheet.pdf	8

6.2 Student's Documentation

Table 6.2: Documents for students (to be shared when TCS is applied)

Document name	Description	File name	# pages
Case scenario	The document for students includes the mission and all necessary information.	SCABEE TCS Design for Material Change (2024) - Base Scenario	30
Drawings and 3D models	The folder contains 3D models of the product's parts and the assembly. The parts/assembly are drawn in Autodesk Inventor (.ipt/.iam file) and compatible with other 3D modelling programs e.g. Solid Works.	Drawings and 3D models	23

6.3 Teacher's Documentation

Table 6.3: Documents for teachers (not to be shared with students)

Document name	Description	File name	# pages
Teacher's note	The document for teachers to guide the students through the Teaching Case Study.	SCABEE TCS Design for Material Change (2024) - Teacher's note	15